WHAT IS CLAIMED IS:

1.   An optical IP switching method, comprising the steps of:

receiving a plurality of optical data packets at an optical switch, wherein each data packet has a payload and header information;

extracting the header information from each of said plurality of data packets;

converting the header information for each of said plurality of data packets from an optical format to an electric format;

processing the header information for each of said plurality of data packets at a control unit to generate control signals to control data packet payload routing through the optical switch;

routing the payload from each of said plurality of data packets through the optical switch in an all-optical manner to at least one desired switch output;

converting the header information for each of said plurality of data packets back to an optical format; and

recombining the payload and header information for each of said plurality of data packets for transmission on at least one output fiber from said at least one desired switch output.

2.   The method of Claim 1, wherein said routing step further comprises:

demultiplexing said plurality of data packet payloads at a plurality of demultiplexers;

assigning each of said plurality of data packet payloads an internal wavelength;

forwarding each of said plurality of data packet payloads to one or more delay buffers based on a current output status;

combining said plurality of data packet payloads at the output of said one or more delay buffers and broadcasting said combined plurality of data packet payloads to a plurality of outputs;

selecting one or more data packet payloads from said combined plurality of data packet payloads to output through at least one of said plurality of outputs;

converting said internal wavelength of said selected one or more data packet payloads using a tunable wavelength converter; and

multiplexing said selected one or more data packet payloads together for transmission on an output fiber from said at least one of said plurality of outputs.

3.   The method of Claim 2, wherein said demultiplexing step further comprises demultiplexing said plurality of data packet payloads based on wavelength.

4.   The method of Claim 2, wherein said assigning step comprises converting an original wavelength of each of said plurality of data packet payloads to said internal wavelength using a wavelength converter.

5.   The method of Claim 4, wherein said wavelength converter is a tunable wavelength converter.

6.   The method of Claim 4, wherein said wavelength converter is a fixed wavelength converter.

7.   The method of Claim 4, wherein said internal wavelength is the same wavelength as the original wavelength.

8.   The method of Claim 4, wherein each data packet payload is assigned a different internal wavelength.

9.   The method of Claim 2, wherein said forwarding step further comprises:

splitting each of said plurality of data packet payloads into a second plurality of data packet payloads, wherein each of said second plurality of data packet payloads is identical to the split data packet payload; and

selecting and forwarding to one of said one or more delay buffers one of said second plurality of data packet payloads for said each of said plurality of data packet payloads that is split.

10.   The method of Claim 9, wherein said current output status is an intended output port for said each of said plurality of data packet payloads.

11.   The method of Claim 9, wherein said selecting step further comprises selecting one of said second plurality of data packet payloads using a Semiconductor Optical Amplifier ("SOA") gate.

12.   The method of Claim 11, wherein said splitting and said selecting and forwarding steps occur at an optical space switch.

13.   The method of Claim 2, wherein said one or more delay buffers are fiber delay line buffers.

14.   The method of Claim 2, wherein one of said one or more delay buffers provides zero delay.

15.   The method of Claim 2, wherein each of said one or more delay buffers provides a delay of one or more unit increments.

16.   The method of Claim 15, wherein said one or more unit increments are equal to the average size of said plurality of data packet payloads.

17.   The method of Claim 2, wherein said combining step further comprises combining all of said plurality of data packet payloads into a single combined output signal.

18.   The method of Claim 17, wherein said single combined output signal is broadcast to said plurality of outputs for providing broadcast and multicast capability, voiceover IP and video-on-demand.

19.   The method of Claim 17, wherein said selecting step comprises demultiplexing said combined output signal based on wavelength.

20. The method of Claim 1, wherein said first converting step further comprises converting the header information from each of said plurality of data packets using a plurality of optical-to-electric converters.

21. The method of Claim 20, wherein said control unit further comprises software instructions to control functionality of said control unit.

22. The method of Claim 20, wherein said control unit provides a control signal based on the header information to control the routing of said plurality of data packet payloads through said optical switch.

23. The method of Claim 1, wherein said second converting step further comprises converting the extracted header information from an electric format to an optical format using a plurality of electric-to-optical converters.

24. The method of Claim 1, wherein said receiving step further comprises receiving a plurality of data packets at an optical switch along one or more input fibers.

25. The method of Claim 24, wherein said optical switch is a wave division multiplexing ("WDM") switching router and wherein said one or more input fibers and said at least one output fiber are WDM fibers.

26. The method of Claim 25, wherein one or more of said plurality of data packets are received at said optical switch along a common one of said on or more input fibers and transmitted from said optical switch along a plurality of different output fibers.

27. The method of Claim 1, wherein said optical switch is independent of the rate of transmission of said plurality of data packets.

28. An optical IP switching router, comprising:

a plurality of input demultiplexers for receiving a plurality of optical data packets and demultiplexing the payloads of said plurality of data packets;

a plurality of optical-to-electric converters for converting header information from each of said plurality of data packets into electric form;

a control unit for processing said converted header information and generating control signals to control data packet payload routing through said optical IP switching router;

a plurality of input wavelength converters for assigning each of said plurality of data packet payloads an internal wavelength;

a plurality of optical space switches for routing each of said plurality of data packet payloads to one of one or more couplers based on a current output status, said one or more couplers for coupling and routing at least one of said each of said plurality of data packet payloads to one of one or more delay buffers;

a buffer coupler for combining said plurality of data packet payloads into a combined output from said one or more delay buffers;

an output splitter for broadcasting said combined output to a plurality of output channels;

an output demultiplexer for each of said plurality of output channels for demultiplexing each of said broadcast combined outputs;

a plurality of output SOA's for selecting one or more data packet payloads from said plurality of data packet

payloads for transmission through at least one of said plurality of output channels;

a plurality of tunable wavelength converters for converting said internal wavelength of said selected one or more data packets;

a plurality of electric-to-optical converters for converting said electric form header information back to optical form for recombining said header information with its respective data packet payload; and

a plurality of multiplexers for multiplexing said selected one or more data packets together for transmission out of said at least one of said plurality of output channels on an output fiber.

29. The router of Claim 28, wherein said demultiplexers demultiplex said plurality of data packet payloads based on wavelength.

30. The router of Claim 28, wherein said input wavelength converters assign a different internal wavelength to each of said plurality of data packet payloads.

31. The router of Claim 28, wherein said plurality of input wavelength converters are tunable wavelength converters.

32. The router of Claim 28, wherein said plurality of input wavelength converters are fixed wavelength converters.

33. The router of Claim 28, wherein said plurality of optical space switches each comprise;

a plurality of input splitters for splitting each of said plurality of data packet payloads into a second plurality of data packet payloads, wherein each of said second plurality of data packet payloads is identical to the split data packet payload; and

a plurality of input SOA's for selecting and forwarding to one of said one or more couplers one of said second plurality of data packet payloads for said each of said plurality of data packet payloads that is split.

34. The router of Claim 28, wherein said current output status is an intended output port for said each of said plurality of data packets.

35. The router of Claim 28, wherein said control unit further comprises software instructions to control functionality of said control unit.

36. The router of Claim 28, wherein said one or more delay buffers are optical fiber delay line buffers.

37. The router of Claim 28, wherein one of said one or more delay buffers provides zero delay.

38. The router of Claim 28, wherein each of said one or more delay buffers provide a delay of one or more unit increments.

39. The router of Claim 38, wherein said one or more unit increments are equal to the average size of said plurality of data packets.

40. The router of Claim 28, wherein said optical IP switching router is independent of the rate of transmission of said plurality of data packets.

41. The router of Claim 28, wherein said optical IP switching router provides broadcast and multicast capability, voiceover IP and video-on-demand.

42. An optical IP router switching method using wavelength domain multiplexing to provide multicast and broadcast functions, comprising the steps of:

receiving a plurality of optical data packets at an optical switch, wherein each data packet has a payload and header information;

extracting the header information from each of said plurality of data packets;

converting the header information for each of said plurality of data packets from an optical format to an electric format;

processing the header information for each of said plurality of data packets at a control unit to generate control signals to control data packet payload routing through the optical switch;

routing the payload from each of said plurality of data packets through the optical switch in an all-optical manner, based on whether the payload is a unicast data packet payload or a broadcast/multicast data packet payload, to at least one desired switch output;

converting the header information for each of said plurality of data packets back to an optical format; and

recombining the payload and header information for each of said plurality of data packets for transmission on at least one output fiber from said at least one desired switch output.

43.   The method of Claim 42, wherein said routing step further comprises:

demultiplexing said plurality of data packet payloads at a plurality of demultiplexers;

assigning each of said plurality of data packet payloads an internal wavelength based on whether said each of said plurality of data packet payloads is a unicast data packet payload or a broadcast/multicast data packet payload;

forwarding each of said plurality of data packet payloads to one or more delay buffers based on a current output status;

combining said plurality of data packet payloads at the output of said one or more delay buffers and broadcasting said combined plurality of data packet payloads to a plurality of output channels;

selecting one or more unicast data packet payloads from said combined plurality of data packet payloads to output through at least one of said plurality of output channels;

selecting none or more broadcast/multicast data packet payloads from said combined plurality of data packet payloads to output through at least one of said plurality of output channels using a plurality of output SOAs;

converting said internal wavelength of said selected one or more broadcast/multicast data packet payloads using a tunable wavelength converter; and

multiplexing said selected one or more unicast data packet payloads together with said selected none or more broadcast/multicast data packet payloads for transmission on an output fiber from said at least one of said plurality of output channels.

44. The method of Claim 43, wherein said demultiplexing step further comprises demultiplexing said plurality of data packet payloads based on wavelength.

45. The method of Claim 43, wherein said assigning step comprises converting an original wavelength of each of said plurality of data packet payloads to said internal wavelength using a tunable wavelength converter, and where said internal wavelengths are unique for unicast data packet payloads and for broadcast/multicast data packet payloads.

46. The method of Claim 43, wherein said forwarding step further comprises:

splitting each of said plurality of data packet payloads into a second plurality of data packet payloads, wherein each of said second plurality of data packet payloads is identical to the split data packet payload; and

selecting and forwarding to one of said one or more delay buffers one of said second plurality of data packet payloads for said each of said plurality of data packet payloads that is split.

47. The method of Claim 46, wherein said current output status is an intended output port for said each of said plurality of data packet payloads.

48. The method of Claim 46, wherein said selecting step further comprises selecting one of said second plurality of data packet payloads using a Semiconductor Optical Amplifier ("SOA") gate.

49.   The method of Claim 48, wherein said splitting and said selecting and forwarding steps occur at an optical space switch.

50.   The method of Claim 43, wherein said one or more delay buffers are fiber delay line buffers.

51.   The method of Claim 42, wherein said first converting step further comprises converting the header information from each of said plurality of data packets using a plurality of optical-to-electric converters, and wherein said second converting step further comprises converting the extracted header information from an electric format to an optical format using a plurality of electric-to-optical converters.

52.   The method of Claim 51, wherein said control unit further comprises software instructions to control functionality of said control unit.

53.   The method of Claim 51, wherein said control unit provides a control signal based on the header information to control the routing of said plurality of data packet payloads through said optical switch.

54.   The method of Claim 42, wherein said receiving step further comprises receiving a plurality of data packets at an optical switch along one or more input fibers.

55.   The method of Claim 54, wherein said optical switch is a wave division multiplexing ("WDM") switching router and wherein said one or more input fibers and said at least one output fiber are WDM fibers.

56.   The method of Claim 55, wherein one or more of said plurality of data packets are received at said optical switch along a common one of said on or more input fibers and transmitted from said optical switch along a plurality of different output fibers.

57.   An optical IP switching router using wavelength domain multiplexing to provide multicast and broadcast functions, comprising:

a plurality of input demultiplexers for receiving a plurality of optical data packets and demultiplexing the payloads of said plurality of data packets;

a plurality of optical-to-electric converters for converting header information from each of said plurality of data packets into electric form;

a control unit for processing said converted header information and generating control signals to control data packet payload routing through said optical IP switching router;

a plurality of input tunable wavelength converters for assigning each of said plurality of data packet payloads an internal wavelength based on whether said each of said plurality of data packets is a unicast data packet or a broadcast/multicast data packet;

a plurality of optical space switches for routing each of said plurality of data packet payloads to one of one or more couplers based on a current output status, said one or more couplers for coupling and routing at least one of said each of said plurality of data packet payloads to one of one or more delay buffers;

a buffer coupler for combining said plurality of data packets into a combined output from said one or more delay buffers;

an output splitter for broadcasting said combined output to a plurality of output channels;

a unicast demultiplexer for each of said plurality of output channels for demultiplexing out of said broadcast combined output one or more unicast data packet payloads;

a plurality of fixed wavelength converters for converting the wavelength of each of said one or more unicast data packet payloads;

a broadcast demultiplexer for each of said plurality of output channels for demultiplexing out of said broadcast combined output one or more broadcast/multicast data packet payloads;

a plurality of output SOA's for selecting one or more broadcast/multicast data packet payloads from said one or more broadcast/multicast data packet payloads for transmission through at least one of said plurality of output channels;

a plurality of tunable wavelength converters for converting said internal wavelength of said selected one or more broadcast/multicast data packet payloads;

a plurality of electric-to-optical converters for converting said electric form header information back to optical form for recombining said header information with its respective data packet payload; and

a multiplexer for each of said plurality of output channels for multiplexing said selected one or more broadcast/multicast data packets together with said one or more unicast data packets for transmission out of said at least one of said plurality of output channels on an output WDM fiber.

58. The router of Claim 57, wherein said demultiplexers demultiplex said plurality of data packet payloads based on wavelength.

59. The router of Claim 57, wherein said control unit further comprises software instructions to control functionality of said control unit.

60. The router of Claim 57, wherein said control unit provides a control signal based on the header information to control the routing of said plurality of data packet payloads through said optical IP switching router.

61. The router of Claim 57, wherein said one or more delay buffers are fiber delay line buffers.